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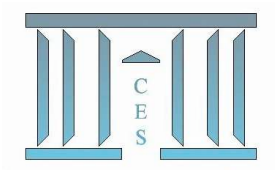

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A Microsimulation on Tax Reforms in LAC Countries: A New Approach Based on Full Expenditures *

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Abstract

In this article we propose a new method to estimate price effects on micro cross-sectional data using full prices that take into account household domestic production. We use behavioral microsimulations by subpopulations to analyze the redistributive impact of changes on Value Added Tax (VAT) rates in Ecuador and Guatemala. Utility analysis is used to evaluate the consequences on households welfare caused by these tax reforms. The proposed model solves the crucial problem of price data availability in developing countries. The estimates of the full price elasticities highlight the importance of the substitution between time and monetary expenditures within the households domestic production function and show that traditional approaches only tell half of the story. In general, the utility estimates seem to be consistent as they have the expected sign and follow the same pattern of changes in consumption.

Keywords: Consumer Demand; Full Prices; Microsimulation; Taxes; Time-Use; Welfare
JEL Classification: D04, D11, D12, D13

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1 Introduction

In the area of welfare analysis, the study of demand patterns is a relevant feature for microsimulations. Thus, to know how individuals respond (in terms of demand for goods and services) to changes in income and prices proves to be, in the literature, an important tool for the design of public policy. Analysis of the distributional impact and welfare costs of indirect taxation reforms are mostly undertaken using arithmetical models. The great limitation of those models is the strong assumption that population does not change its consumption pattern as a result of these policy changes. The most commonly used data sources are time series and cross-sectional data. Price elasticities estimated in macroeconomic time-series are generally considered as being not robust to the specification of the demand system and to the estimation method. They suffer from aggregation biases, lack of microeconomic information, and moreover the stationarity conditions are generally rejected for long term series. Also, estimation from macro data gives no information on the change of price effects according to the household characteristics such as age of the family head, family structure or its level of well being. This makes distributive analysis quite difficult, specially when we want to know what segments of the population would be the most affected by a particular reform.

In this paper, we use microsimulations to analyze the redistributive impact of changes in the structure of Value Added Tax (VAT) rates of Ecuador and Guatemala once household domestic production is taken into account. The specific features of these countries make the analysis particularly interesting in terms of economic policy. Roughly speaking poverty affects 40% of the population and the level of inequality is among the highest in Latin America. Moreover, there seems to exist in the literature no estimation of income and price elasticities using micro-data in Ecuador and Guatemala.

By using micro data from national surveys, we are able not only to get a picture of the population as a whole, but also to differentiate it by income level, age, and family structure, all important dimensions for distributive analysis. Our simulation exercise is based on households data that usually present some shortcomings. The most important one is data availability. The record of prices and quantities of goods and services consumed by the households is rarely available for all commodity groups. Indeed, in most cases we would have unit values for purchased food items only, turning the estimation of consumer demand almost impossible for the other types goods and services. Since prices were not provided in the corresponding surveys, we construct them using a method that allows us to obtain unit values for each commodity group, and estimate full income and full price elasticities by subpopulations. The behavioral microsimulation is based on the estimation of the Almost Ideal Demand System proposed by Deaton and Muellbauer (1980). The data used for the analysis comes from the combination of Household Expenditures and

Time Use surveys.

The main contributions of this paper are: First, to introduce household domestic production in the estimation of demand systems by the incorporation of "full-prices" proposed by Gardes (2013), and second, to overcome the lack of prices data in households surveys faced by most of developing countries.

The paper is organized as follows. Section 2 presents the microsimulation model, Section 3 gives an overview of the main policy instruments of the Ecuadorian and Guatemalan tax-benefit system, as well as a description of the two datasets used for the estimation. Section 4 displays the main results and concludes.

2 The Model

This section is divided in four parts. First, we describe the model. Second, we discuss how we carried out the computation of the behavioral change associated with price variations. Third, we present a summary of the construction of an index of scarcity, treated as a unit value for the construction of the full price proposed by Gardes (2013). Fourth, we present a way to compute utility changes due to the tax reform.

2.1 Model

To undertake welfare analysis that takes into account demand responses to changes in prices, we use the Almost Ideal Demand System (AIDS) specification proposed by Deaton and Muellbauer (1980) (an estimation using the quadratic form on log-income gives very similar results as concerns price coefficients, see Banks et al. (1997), and Gardes et al. (2005)). The AIDS is the most commonly used specification to estimate demand elasticities. One of the main advantages of the model is that even if the model is nonlinear, one can use a Stone's price index to approximate the AI model to its linear version LAIDS, so as to facilitate estimation. A bias affects the estimates of price coefficients because of the endogeneity of the Stone price index used in the AI specification. It can be corrected using the approximate formulas proposed by Pashardes (1993). All estimations are performed under symmetry and homogeneity constraints.

Expenditure was classified into nine goods for Ecuador and eight goods for Guatemala. We estimate our results by Seemingly Unrelated Regressions, composed of eight and seven demand equations respectively, one of the n equations is dropped to impose the adding-up restriction according to Barten's theory. We consider Engel curves that include on the right hand side of the equation the log of the instrumented expenditure, the log of prices, and the standard socio-economic characteristics of the households.

2.2 Simulation of Behavioral Changes

In order to simulate the consumers reaction due to tax changes, it is assumed that household preferences can be represented by the above AI demand system estimated for the whole population. Demand (expenditure), for each of the consumption groups, is given by:

$$w_i = \alpha_i + \beta_i log\left(\frac{y}{m}\right) + \sum_j^n \gamma_{ij} log p_j + \lambda_i Z + \varepsilon_i \quad (1)$$

Where $i = 1, ..., n$ denotes the different commodity groups, y the household expenditure, p the full price of the commodity, Z some socio-economic characteristics of the household, and m is the Stone's price index after the correction by Pashardes (1993).

Broadly speaking, once the above estimation has been carried out, the estimated parameters of the Engel curves are used to calculate income and price elasticities, as well as changes in consumption due to monetary price variations. We do it under the assumption that the full price is an indicator of scarcity of the good and its effect on consumption can be used to compute the effect of a change of the monetary price. The simulation is done for each household in the dataset. It can be performed under several definitions of equivalent income[1], and for several policy changes concerning taxes and benefits. This facilitates the computation of distributional measures. Results for the status quo and the post-reform scenario are given in Tables 3 and 4 for the whole sample and for each sub-populations independently.

The changes in consumption of the given commodities after the reform are calculated by the derivative of the demand function and not by the conventional approach using price elasticities. We think that calculating the derivatives is a more direct method and it is certainly as robust as the conventional one. In spite of this, we had to control for some distortions introduced due to zero consumption. If a household present a positive expenditure for a good in the status quo, its budget share equals zero. In order to be consistent with the consumption pattern of these households, their corresponding budget shares must remain null after the reform takes place. However, regardless of the method applied, the estimated changes in consumption generate positive or negative budget shares for all the households in the sample even when they do not report any consumption for the given commodities. When we take this consumption back to zero, as it was in the status quo, some distortion appears due to the sum of the budget shares. We deal with this problem by normalizing the sum of the new budget shares to one, as it was before the reform.

The use of full prices allows us to distinguish two different hypotheses for the consumer problem: In the first one, we consider two indirect maximization programs, one for

[1] Equivalent income = Household net income / $\sqrt{n}$, where n is the number of persons in the household.

monetary endowments and another one for time allocation. This scenario is more likely to apply in lower income groups, as their monetary constraint is stronger. Indeed higher income groups have the possibility to substitute between the monetary and time spheres more freely. Whereas in the second hypothesis, we assume that there is only one utility function, depending on full expenditures, to be maximized by the agent. In this paper, we perform the simulations under these two different hypothesis.

Limitations

We assume that the totality of the price effects due to tax changes are absorb by the consumers. We do not take into account tax evasion due to informal consumption, and we do not consider other taxes on capital income.

Note that the model is primarily aimed at quantifying the potential impact of different policy reforms by simulating the change in consumption patterns, taking into account the household domestic production (in a Beckerian framework).

2.3 Definition of full prices

The way in which full prices are defined allows us to overcome problems associated with price data availability, and in particular to estimate consumer demands for every good and service for which a corresponding time expenditure is observable.

Full prices are defined as the ratio of full expenditure over monetary expenditure: with monetary price for commodity (activity) i as p_i, monetary expenditure is: $p_i x_{ih}$. The time-use price writes $w_h t_{ih}$ or $min\, wage * t_{ih}$ according to the time valuation by the average opportunity cost for household w_h or by the minimum wage rate. The monetary expenditure is $p_i x_{ih}$ and full expenditure: $(p_i + w_h t_{ih})x_{ih}$ or $(p_i + min\, wage * t_{ih})x_{ih}$ depends on households characteristics by means of its time participation to activity i: t_{ih} and its opportunity cost for time w_h. We can measure the full price for activity i by the ratio of full expenditures over their monetary component: $\pi_{ih} = \frac{(p_i + w_h t_{ih})x_{ih}}{p_i x_{ih}} = \frac{p_i + w_h t_{ih}}{p_i} = 1 + \frac{w_h t_{ih}}{p_i}$, which no longer depends on the quantity consumed x_{ih}.

Note that, under the assumption of a common monetary price p_i for all households, this ratio contains all the information on the differences of full prices through w_h and t_{ih} (for instance its logarithm in the AI specification is approximatively equal to $\frac{w_h t_{ih}}{p_i}$ for small values of this product). Possible endogeneity in the full demand equations (between full expenditure for i: $(p_i + w_h t_{ih})x_{ih}$ and the vector of full prices $\frac{p_k + w_h t_{kh}}{p_k}$ for all commodities k) is corrected by defining prices by the alternative valuation (for instance minimum wage when full expenditures are computed with the opportunity cost).

Also notice that, holding constant the cost of time, an increase in monetary price due to a change of the VAT corresponds only to a change in the monetary component of the full price. So that, the change in the latter one is smaller than the change of the VAT. Basically, define $\pi'_{ih} = p_i \pi_{ih}$. If $w_h t_{ih}$ is hold constant $\partial \pi'_{ih} = \partial p_i := \alpha_i$. Then, $\frac{\partial \pi'_{ih}}{\pi'_{ih}} = \frac{\alpha_i}{p_i + w_h t_{ih}} = \frac{\alpha_i}{p_i} \frac{p_i}{p_i + w_h t_{ih}} = \frac{\partial p_i}{p_i} \frac{p_i}{\pi'_{ih}}$, where $\frac{\partial p_i}{p_i}$ is the change in the monetary price.

In the economic literature, there is an ongoing discussion regarding the appropriated measure of the opportunity cost of time. We estimate our model using two different definitions of time valuation. In the first one, we use the minimum wage as the opportunity cost, which implies a uniform cost of domestic production for the whole population. In the second one, we consider that an hour spent in domestic production is perfectly substitutable with one hour spent in the job market; therefore, we use the market wage to valuate time.

Gardes (2013) presents a method to estimate the opportunity cost for time for each household using a domestic production scheme depending on the time and money used to produce each activity. The estimated opportunity cost in France is, in average, smaller than the market wage net of taxes by 15 to 30%. However, we think that in the case of Ecuador and Guatemala the minimum wage is a better proxy for the opportunity cost of time since the rigidities of the job markets are an important constraint.

2.4 Computation of Well-Being

We suppose that utility depends additively on the quantities of activities Q_i which themselves are produced under a Cobb-Douglas scheme by money and time inputs m_i and t_i. The optimization program can be written as for each agent (see Gardes (2013), for details):

$$\underset{m_i, t_i}{Max}\ u(Q) = \prod_i a_i Q_i^{\gamma_i} \tag{2}$$

with $Q_i = m_i^{\alpha_i} t_i^{\beta_i}$ under the full income constraint:

$$\sum_i (m_i + \omega t_i) = w t_w + \omega (T - t_w) + V \tag{3}$$

With T equal the total endowment of time, t_w the market labor time supplied by the individual, and V the other non labor incomes. Note that with $T - t_w = \sum_i t_i$ both the market wage and the shadow wage (the opportunity cost for time) intervenes in the budget equation: the shadow wage corresponds to the valuation of time in domestic production, and differs from the market wage w whenever there exists some imperfection on the labor

market. For instance when the disutility of labor is smaller for domestic production, or in case of multiple simultaneous home activities (i.e. taking care of children while preparing meals).

This utility function can be re-written:

$$u(Q_i) = \prod_i a_i Q_i^{\gamma_i} = \prod_i a_i \Big[\prod_i m_i^{\alpha_i\gamma_i / \sum \alpha_i\gamma_i} \Big]^{\sum \alpha_i\gamma_i} \Big[\prod_i t_i^{\beta_i\gamma_i / \sum \beta_i\gamma_i} \Big]^{\sum \beta_i\gamma_i}$$
$$= a(m'^{\sum \alpha_i\gamma_i})(t'^{\sum \beta_i\gamma_i}) \quad (4)$$

with m' and t' the geometric weighted means of the monetary and time inputs with weights $\alpha_i\gamma_i / \sum \alpha_i\gamma_i$ and $\beta_i\gamma_i / \sum \beta_i\gamma_i$. Deriving the utility over m' and t' gives the opportunity cost for time as their ratio: $\omega = \frac{\frac{\partial u}{\partial t'}}{\frac{\partial u}{\partial m'}} = \frac{m' \sum \beta_i\gamma_i}{t' \sum \alpha_i\gamma_i}$ [2]

According to the Relative Risk Aversion specification of utility, $(1 - \sum \alpha_i\gamma_i)$ is equal to the Arrow-Pratt index of relative risk aversion (also equal to the income elasticity of the marginal utility for monetary expenditures or the inverse of Frisch's income flexibility). Note that utility $u(Q)$ is defined by equation 2 up to an increasing function of u, so that all powers of u also act as a utility function $\upsilon = u^\delta$. In order to calibrate δ, the income flexibility can be recovered by the estimation of a demand system under the assumption of strong separability of the utility (for instance a Rotterdam model under additive separability). For the French dataset, the estimated risk aversion index is 0.84, so that $\delta = 0.39$.

As explained in Gardes (2013) there are two ways in which the utility function can be calibrated. In this paper, in order to have an estimation of well-being before and after the tax reform, we estimate the utility function as follows: we replace m by the total monetary expenditures and t by the total time in hours spent in home production activities. We take the average monetary budget shares of each commodity as the coefficients of γ_i, and we define α_i and β_i as the ratio of monetary and time expenditure in the first order condition. Assuming the absence of economies of scale in the domestic production we set $\alpha_i + \beta_i = 1$. For the sake of comparison, as it is done in the calculation of the total expenditure, we use two different types of opportunity cost for time, the minimum wage and the market wage of the household. Finally, we use the value of δ obtained for the french data.

[2] For French data Gardes (2013), the opportunity cost for time is 8.30 in average, with a range between 3.5 and 32. It is significantly smaller than the average net wage rate (9.69), with 73% of households having an opportunity cost lower by more than one quarter than its wage rate. That estimation, close to the minimum wage (6.92), corresponds qualitatively to the answer of individuals in direct surveys on their substitution between time and money. Moreover, is positively indexed on the household's net wage (with an elasticity of 0.85) and on income (conditional to net wage: elasticity of 0.19). It increases till the head is 45 years old, then decreases by one unit 15 years later. It also increases with family size, especially with respect to the number of adults, which shows that home production is more valued in large families because of economies of scale (i.e. production of public goods).

3 Datasets

In this section, we first give an overview of the Ecuadorian and Guatemalan tax system. Second, we present the datasets and the procedures that were implemented on them before the simulation.

3.1 The Ecuadorian and Guatemalan Tax System

Ecuador

As in most of the developing countries, the major characteristic of the Ecuadorian tax system is the fact that indirect taxes constitute the main source of tax revenue. Until 2007, more than 20% of the total revenue of the non-financial public sector came from a single tax, the Value Added Tax (VAT). From to 2008 and on, it represents just 15%, since the rise in oil prices increased the fraction of oil revenues on the governmental budget, that went from 25% to 40%. During the surveys period 2006-2007, the general VAT rate was 12%. Some exceptions with zero tax rates or tax exemptions exist on food items, agricultural inputs, medical goods, books, government purchases, education, and some professional services.

Guatemala

Guatemala suffered from a civil war that lasted for 36 years and which ended in 1996 with a peace treaty. The most important point to highlight in the Guatemalan case, is that the tax revenue of the Central Government never exceeded 12% of GDP, despite several tax reforms implemented over the years. Around 75% of this revenue comes from indirect taxes, among these the most important being the VAT. As in the case of Ecuador, during the survey period, the VAT rate was 12%. There are, as well, some exceptions with a zero rate and tax exemptions, as is the case for food, non-piped water, education, and the export of goods.

3.2 The datasets

The datasets used in the model were built using the Guatemalan National Survey on Conditions of Life (ENCOVI) for the year 2000, which contains informations on both monetary expenditure and time use. The Family Expenditure Survey (ECV) for the year 2006 has been used for Ecuador as well. But, as the ECV does not contain Time Use data, a separate survey, the National Survey of Employment and Unemployment (ENEMDU) for the year 2007 was also used. AppendixA gives some descriptive statistics of these surveys.

In the case of Ecuador, we proceeded with the matching of the two different surveys by a Tobit regression on similar socio-demographic characteristics in both datasets. The selection equation concerns the households having a positive Time Use records of their activities. For each activity on the Time Use survey, we estimate time use equations for all the observations on the dataset. We use these estimates to predict the time spent on these activities for all the observations on the Family Expenditure Survey. This allows us to have both monetary and time expenditure for all households in order to construct the full prices.

In both datasets, the sampling unit is a dwelling or housing structure, and information regarding the household or households occupying each dwelling is collected. The datasets display some socio-economic and demographic information, separately, for all individuals in the sample. Therefore, in order to get observations at the household level, we aggregate the information over all the individual members of the household. Incomes reported in the surveys are gross of taxes, and they are disaggregated in such a way that information regarding social benefits such as holiday bonus, the thirteenth and fourteenth wages, and contributions to social security can be recovered. There are three sources of labor income: main job, secondary job, and other jobs; and different sources of non-labor income. For the present analysis, all type of income sources (labor, pension, rent, private and public transfer, etc.) are considered.

Some adjustments are made in the construction of the Ecuadorian and Guatemalan data sets from the original surveys data. First, in order to avoid problems related with child labor in the valuation of time, we work with a reduced sample of households that have either no-children or children aged less than 16 years old. Second, for the same reason, the income of children is not included in the total household income. Third, given that some pensions and governmental transfer incomes are mistakenly reported, we impute the official value for these cases. Fourth, in the surveys there is a variable that assigns to every individual a position within the household; that is, the individual may be the head of the household, a spouse, a child, etc. Households where there are adults other than the household head and his/her spouse, including households with "domestic employees", are withdrawn from the sample as we cannot assume income pooling within the family, even though they live in the same house. The elimination of these households also allows us to avoid possible problems related with economies of scale generated by the presence of domestic employees. Fifth, prices were not provided in the corresponding surveys, but the definition of full price allowed us to obtain unit values for each commodity group. Since unit values are generally assumed to reflect quality effects (an expensive bread may have a higher quality) , following Cox and Wohlgenant (1986), we adjusted for quality differences among households by regressing unit values on selected sociodemographic characteristics, such as region, household size, and household income. Sixth, since not all households purchased

all commodities during the survey period, prices were not observed for non consuming households. Whenever this was the case, the mean price was used instead. Seventh, we regroup time and monetary activities on nine categories for Ecuador, and eight categories for Guatemala: Personal Care-Time Personal Care Expenditure, Health Care-Health Care Expenditure, Eating and Cooking Time -Food Expenditure, House Maintenance Time Dwelling Expenditures, Clothing Maintenance-Time Clothing Expenditures, Education Time Education Expenditure, Transportation Time Transportation Expenditures, Leisure Time- Leisure Expenditures, and Miscellaneous Time -Miscellaneous Expenditures. Finally, two methods have been used to value the time spent on domestic activities. First, this value is simply the official minimum wage rate for this period in Ecuador and Guatemala. Second, when time is supposed to be perfectly exchangeable between market and non market activities, the opportunity cost of non-market work is computed as the expected hourly wage rate on the labor market. For not working individuals it is estimated separately for man and woman using the two-steps Heckman method. Both valuation methods are adjusted for income taxes and the estimated numbers of working days and hours. As mentioned in the previous section, Guatemala suffered from a civil war that last for 36 years and which only ended in 1996. By the year 2000 we consider that all the prices distortions created by the civil war (i.e. rise in the price of inter-regional transport, scarcity of some primary commodities, etc) had already disappeared, so that it would not be a problem while performing the estimations.

4 Results

As expected, the own-price elasticity is negative for all considered goods (see the diagonal in table 1 and 2), and significantly different from zero. The estimates range from -1.5 and 0 which seems a correct estimation, the elasticities of Guatemala being smaller than those of Ecuador. However, if we compare to the macroeconomics estimations that oscillate between -0.1 and -0.3; our elasticities are much higher in absolute value. As we have already pointed out, elasticities derived from macroeconomic data face measurement errors and possible aggregation bias. Such low estimates implies a very small elasticity on demand which is not appropriate in most cases. We also observe that the correction of quality decreases the magnitude of the elasticities estimates, for both full price elasticities and monetary elasticities (not shown in the tables). The effective decrease is around 15-20% of the elasticity value. This decrease is consistent with the theory since prices includes quality, therefore, once the quality effect is corrected, the elasticity is smaller.

Regarding the estimation of the LAIDS with and without the separability constraint, we observe a large distance between the two estimations. The price elasticity parameters

under strong separability have smaller magnitude than those estimated without the latter restriction. We therefore have important suspicions of non separability. The assumption of strong separability can be parametrically tested by comparing the prices elasticities computed under separability constrains to those estimated without it. The latter test was performed in the Guatemala dataset and the likelihood differences were highly significant, as a result we conclude on the absence of strong separability between categories. Therefore, Frisch method to calculate price elasticities by means of income elasticities and the flexibility of income (inverse of the income elasticity of the marginal utility of money) cannot be used on this kind of data.

Table 1: Full Cross-Price Elasticities for the whole sample. Minimum Wage, Ecuador

Cross-Price Elasticities									
Commodity Groups	Food	Housing	Transport	Clothing	Personal Care	Health	Education	Leisure	Others
Food	-0.766	0.492	0.419	0.418	0.404	0.643	0.461	0.373	0.525
Housing	0.151	-1.115	0.142	0.120	0.122	0.149	0.126	0.113	0.167
Transport	0.066	0.073	-1.088	0.065	0.064	0.065	0.014	0.060	0.080
Clothing	0.062	0.058	0.061	-1.021	0.058	0.058	0.063	0.054	0.057
Personal Care	0.076	0.075	0.077	0.074	-1.004	0.075	0.080	0.069	0.073
Health	0.065	0.049	0.042	0.039	0.040	-1.343	0.063	0.040	0.061
Education	0.060	0.054	0.012	0.055	0.040	0.081	-1.140	0.065	0.021
Leisure	0.233	0.230	0.240	1.055	0.055	0.247	0.313	-0.796	0.235
Others	0.060	0.062	0.058	2.055	0.229	0.068	0.019	0.043	-1.248

All respective elasticities are calculated using the sample means of the data.
Price elasticities are estimated under symmetry and homogeneity constraints.

Table 2: Full Cross-Price Elasticities for the whole sample. Minimum Wage, Guatemala

Cross-Price Elasticities								
Commodity Groups	Food	Housing	Transport	Clothing	Personal Care	Health	Education	Leisure
Food	-0.739	0.463	0.552	0.389	0.362	0.667	0.340	0.313
Housing	0.285	-0.813	0.245	0.212	0.210	0.225	0.201	0.195
Transport	0.081	0.058	-1.198	0.050	0.031	0.107	0.008	0.047
Clothing	0.060	0.053	0.052	-0.837	0.011	0.015	0.041	0.016
Personal Care	0.048	0.045	0.028	0.009	-1.034	0.122	0.014	0.016
Health	0.029	0.016	0.031	0.004	0.040	-1.462	0.021	0.008
Education	0.077	0.074	0.012	0.060	0.024	0.113	-0.657	0.040
Leisure	0.055	0.056	0.056	0.018	0.022	0.033	0.031	-0.714

All respective elasticities are calculated using the sample means of the data.
Price elasticities are estimated under symmetry and homogeneity constraints.

As mentioned above, the ecuadorian data comes from a match of two different surveys.

The econometric procedure used here has imputed a positive consumption of time for all activities to each household in the survey, even when not monetary expenditure is reported. However, having a zero monetary consumption does not necessary imply a zero time expenditure. As we cannot differentiate which households did have an actual consumption, we could not correct the distortion generated in the time expenditure data. Basically, since certain households may have not executed some of those activities, we overestimated their time and full expenditure. Hence, these results must be carefully interpreted.

Table 3 shows the composition of household expenditure before and after the 5% VAT increase of food by income group, while table 4 shows the percentage change in the consumption of food after the tax increase. By comparing the results among different income groups, we see how households change the amount allocated to the different consumption commodities, in particular, households in all income groups reduce their expenditure on food, a necessary good, by 1% on average in both countries.

Table 3: Household Monetary Expenditure under Status Quo and Post Reform by Income Group

	Ecuador: Status Quo (American Dollar)					**Guatemala:** Status Quo (Quetzales)				
Minimum Wage Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	1350.58	919.16	1143.49	1448.27	1894.69	6022.47	3601.15	4700.60	6291.76	9500.06
Housing	353.64	131.44	208.65	336.60	739.29	4784.76	1978.54	2562.52	3821.73	1,0782.63
Transport	252.56	86.11	143.46	229.60	552.05	1606.80	220.71	361.35	879.86	4968.85
Clothing	140.56	56.67	84.90	139.66	281.61	795.20	330.69	417.08	721.45	1712.56
Personal Care	79.51	31.35	54.13	78.79	154.06	671.52	212.77	317.76	599.85	1556.64
Health	199.85	102.26	133.04	185.04	379.68	391.42	131.92	227.78	316.06	890.43
Education	110.50	35.76	65.83	103.18	237.66	465.58	135.28	220.15	372.75	1134.87
Leisure	199.73	61.83	113.75	202.41	421.92	602.81	122.88	188.39	393.40	1707.75
Others	275.17	54.26	111.87	223.62	712.20	-	-	-	-	
	Ecuador: Status Quo (American Dollar)					**Guatemala:** Status Quo (Quetzales)				
Market Wage Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	1340.44	911.79	1135.92	1433.14	1877.27	5969.26	3582.87	4668.23	6237.36	9403.00
Housing	357.32	134.69	212.01	343.77	744.31	4816.40	1990.85	2580.98	3848.16	1,0841.34
Transport	253.61	86.58	144.55	231.33	554.12	1614.38	221.62	363.37	888.09	4988.60
Clothing	140.99	57.46	85.20	140.06	282.19	798.83	332.22	420.15	727.15	1716.62
Personal Care	80.25	31.84	54.95	79.79	154.63	675.99	214.00	320.71	605.76	1563.65
Health	201.98	103.62	133.72	186.66	382.95	395.51	133.11	231.86	320.43	894.40
Education	110.95	36.11	66.13	103.24	239.77	466.50	136.12	220.83	374.72	1135.26
Leisure	199.93	62.09	114.29	202.89	422.09	603.70	123.15	189.51	395.17	1710.91
Others	276.64	54.66	112.34	226.29	715.81	-	-	-	-	

In general, the monetary expenditure changes show a decrease in food consumption and an increase in all other goods consumption. While the changes in time expenditure (see AppendixB) present the opposite behavior in the consumption patterns of the households, which clearly shows the substitution between the monetary and time spheres. For example, an increase in the price of food decreases the purchases of prepared meals and

increases the time spent in the preparation of food at home. As a consequence, the changes in the full consumption depends on which of these spheres has a heavier weight in the total consumption change. For instance, for a given commodity, when the change in time consumption is more important than the change in monetary consumption, the change in full consumption will follow the direction of the former one. Hence, the importance of taking into account the domestic production of the household in the microsimulation exercises.

Table 4: Percentage Change of Monetary Food Consumption for a 5% increase in VAT for food

	Income Groups									
	Ecuador					Guatemala				
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Minimum Wage	-0.73%	-0.78%	-0.67%	-1.02%	-0.88%	-0.92%	-0.52%	-0.78%	-0.86%	-1.05%
Market Wage	-0.54%	-0.34%	-0.52%	-0.77%	-1.12%	-1.51%	-0.71%	-1.13%	-1.46%	-3.21%

Households with higher income have a bigger decrease in food consumption, which can be explained by the importance of monetary constraints in poorest households. Therefore, it is less likely for those families to substitute or decrease the consumption of food, as this commodity accounts for more than 50% of the total expenditure. The small changes in consumption of the other commodities are attributed to the cross price and income effects. We also see that this change is stronger for the richer households when time is valuated at the market wage because their time is significantly more costly than it is for poorer households.

In order to have a better understanding of the produced changes (as the sum of all changes equals zero), we calculate a distance index [3] between the allocated expenditure vectors before and after the reform takes place. Table 5 presents the distance indices by income group among the monetary, time, and full expenditure vectors for Ecuador and Guatemala. A quick glance at the tables shows that, in both countries, the richest households in the population are the less affected by the VAT increase in the monetary dimension, when the minimum wage is used.

This tendency is reversed when the market wage is taken into account. Indeed, in both countries and in the three dimensions, the richest quartiles are always the most affected. As explained above, this is due to the huge differences in the market wage between the richest and poorest population. This effect is more evident in the case of Guatemala: when the minimum wage is used, the changes in full expenditure follow the path of the monetary

[3]The distance index is calculated as follows: $\sum_i \left| \frac{x_i^{pr} - x_i^{sq}}{x_i^{sq}} \right|$ where $i = 1, ..., n$ denotes the good, *pr* post reform, and *sq* the status quo.

changes. However, when the market wage is used, they follow the path of the time expenditure changes as its valuation is higher. It is important to notice that the changes in full expenditure are lower in magnitude than the changes in monetary and time expenditure separately. This highlights the relevance of the introduction of domestic production into the estimations since the substitution effect between time and money is taken into account.

Table 5: Distance Index by Income Groups

	Income Groups									
	Ecuador					Guatemala				
Minimum Wage	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Monetary	0.055	0.100	0.069	0.080	0.048	0.0453	0.0432	0.0633	0.0663	0.0332
Time	0.002	0.002	0.002	0.005	0.004	0.0633	0.0651	0.0714	0.0720	0.0543
Full	0.017	0.015	0.012	0.025	0.022	0.0232	0.0175	0.0266	0.0326	0.0172
Market Wage	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Monetary	0.038	0.041	0.054	0.064	0.055	0.0453	0.0432	0.0633	0.0663	0.0332
Time	0.002	0.001	0.002	0.002	0.003	0.0633	0.0651	0.0714	0.0720	0.0543
Full	0.011	0.012	0.012	0.018	0.017	0.0232	0.0175	0.0266	0.0326	0.0172

Table 6: Distance Index by Age Range

	Age Range							
	Ecuador				Guatemala			
Minimum Wage	**WS**	**-30**	**30-60**	**60+**	**WS**	**-30**	**30-60**	**60+**
Monetary	0.0555	0.0586	0.0507	0.1317	0.0453	0.0506	0.0483	0.0273
Time	0.0032	0.0021	0.0060	0.1803	0.0633	0.0704	0.0588	0.0556
Full	0.0175	0.0151	0.0182	0.1587	0.0232	0.0261	0.0278	0.0117
Market Wage	**WS**	**-30**	**30-60**	**60+**	**WS**	**-30**	**30-60**	**60+**
Monetary	0.0379	0.0419	0.0457	0.0305	0.0687	0.0699	0.0801	0.0388
Time	0.0022	0.0021	0.0018	0.0037	0.1259	0.1194	0.1332	0.1012
Full	0.0124	0.0107	0.0141	0.0112	0.0528	0.0456	0.0606	0.0507

Table 6 and 7 show the same index, but this time by age range and education level. When the population is grouped by age range, there is no clear pattern in the changes of any of the expenditures. Indeed, the big heterogeneity within the groups, in particular the group of 30-60 makes any evaluation more difficult under both definitions of time valuation. What is interesting to see is that for Ecuador, the difference in magnitude between indices for the oldest population compared to others is important when time is valuated by minimum wage. This distortion can be explained by the fact that the minimum wage for this population is double than the estimated market wage, while for the other groups it is the same or higher. Therefore, along with what happens with the valuation of time for the rich population when we use the market wage, the difference in wages affects the magnitude of the index through the valuation of time.

Table 7: Distance Index by Education Level

	Education Level							
	Ecuador				Guatemala			
Minimum Wage	**WS**	**Primary**	**Secondary**	**Tertiary**	**WS**	**Primary**	**Secondary**	**Tertiary**
Monetary	0.0555	0.0786	0.0633	0.0482	0.0453	0.0494	0.0451	0.0358
Time	0.0032	0.0029	0.0054	0.0242	0.0633	0.0655	0.0616	0.0447
Full	0.0175	0.0152	0.0201	0.0229	0.0232	0.0234	0.0291	0.0177
Market Wage	**WS**	**Primary**	**Secondary**	**Tertiary**	**WS**	**Primary**	**Secondary**	**Tertiary**
Monetary	0.0379	0.0404	0.0562	0.0788	0.0687	0.0712	0.0923	0.1058
Time	0.0022	0.0012	0.0023	0.0036	0.1259	0.1073	0.1876	0.2794
Full	0.0124	0.0119	0.0163	0.0279	0.0528	0.0475	0.0790	0.1340

The most striking example of this effect can be seen on the contradictory behavior described by the distance index where the population is categorized by education level. For instance, in both countries, when the minimum wage is used, the most affected households are those with primary education and the less affected ones, those with tertiary education. On the other hand, when the market salary is used, we observed an opposite effect: the most affected households are those with tertiary education and the less affected ones, those with primary education. This shows the importance of using an adequate valuation of time that takes into account the countries particular socio-demographic and economic characteristics.

We think that the minimum wage is a better proxy of the true opportunity cost for these two countries. This should apply in the more general case to developing countries where the wages of the domestic employees are very close or even lower than the minimum wage. This allows a cheaper substitution between performing certain activities and employing someone else to carry them out.

As mentioned above, the income inequality in Guatemala is much higher than in Ecuador. This explains the difference in the magnitude of the distance indices between the two countries. Therefore, in countries where inequality is high we can expect the higher income class to be more affected by price changes, when the market wage is used as the opportunity cost of time.

Table 8: Utility Changes After the Reform by Income Groups

	Income Groups									
	Ecuador					Guatemala				
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Minimum Wage	-0.221%	-0.329%	-0.232%	-0.306%	-0.122%	-0.284%	-0.226%	-0.310%	-0.418%	-0.105%
Market Wage	-0.153%	-0.157%	-0.188%	-0.241%	-0.154%	-0.478%	-0.263%	-0.496%	-0.802%	-0.598%

Finally, Tables 8, 9, and 10 show preliminary estimations of the changes by subpopulation in consumer utility (equation 2) after the reform. The first thing to notice is

that, as expected, the changes in utilities after the reform are all negative no matter the grouping structure of the population. Secondly, in both countries, when the opportunity cost of time is valuated at the minimum wage it is mostly the richest population that is less affected. This is consistent with the results of the distance indices by income quartiles and education level. Thirdly, when the market wage is used instead, the middle class -quartiles 2 and 3- seems to be more impacted by the effect of the tax. What is interesting to see, is that when the population is grouped by education level, those with secondary education are the most affected. This is consistent with the results by income quartiles. Those with primary and tertiary education present changes in utility that are very close to each other.

Table 9: Utility Changes After the Reform by Age Range

	Age Range							
	Ecuador				Guatemala			
Age Range	**WS**	**-30**	**30-60**	**60+**	**WS**	**-30**	**30-60**	**60+**
Minimum Wage	-0.221%	-0.188%	-0.205%	-0.264%	-0.284%	-0.308%	-0.307%	-0.105%
Market Wage	-0.153%	-0.140%	-0.157%	-0.118%	-0.478%	-0.463%	-0.575%	-0.113%

Table 10: Utility Changes After the Reform by Education Level

	Education Level							
	Ecuador				Guatemala			
Educational Level	**WS**	**Primary**	**Secondary**	**Tertiary**	**WS**	**Primary**	**Secondary**	**Tertiary**
Minimum Wage	-0.221%	-0.280%	-0.236%	-0.093%	-0.284%	-0.302%	-0.210%	-0.052%
Market Wage	-0.153%	-0.161%	-0.196%	-0.159%	-0.478%	-0.440%	-0.634%	-0.460%

In order to verify the robustness of the results, we recalculate the household utilities before and after the reform, using the mean full budget shares instead of the monetary budget shares. The obtained estimations are consistent with both calibrations, they both follow the same direction. As it is the case for the changes in consumption, the magnitude of the vector is smaller once the full budget share is used.

Conclusions

In this paper, we performed a behavioral microsimulation to assess the redistributive effect of a 5% VAT increase on food. The model calculates the changes in consumption, and the new distribution of total expenditure on the different commodity groups among households.

The methodology that we present in this paper solves the problem of price data availability in developing countries by constructing unit values for each commodity group.

It is important to notice that the matching procedure used for the ecuadorian surveys, imputes a positive value of time consumption to all households, generating a distortion in the time estimates. Because of that, the time estimation and full estimation are less robust for the matched surveys. One has to be careful while working with matched data specially when there are strong suspicions of zero time consumption among households.

Concerning the estimation of direct price elasticities, we see that our estimates range from -1.5 and 0. This seems a correct estimation, the elasticities of Guatemala being smaller than those of Ecuador. The Ecuadorian population seems to have a bigger dynamism and demand is more elastic to price than Guatemala. The results also indicate that full elasticities differ in a significant way from the monetary ones, suggesting that the incorporation of domestic production through the valuation of time can have a relevant impact on the design and outcomes of public policy.

Regarding the results from the microsimulation, in both countries, when the minimum wage is used to calculate the opportunity cost of time, the richest households in the population are the less affected in the monetary dimension by the VAT increase. This fact is consistent with the regressive nature of the VAT. However, this tendency is reversed when the market wage is taken into account. Indeed, in both countries and in the three dimensions, the richest quartiles are always the most affected. As it has already been explained, this is due to the huge inequality in the market wage between the richest and the poorest population. So, as expected, the magnitude of the vectors is lower when the cost of time is evaluated at a constant wage.

The sensitivity of the results puts in evidence the importance of choosing an adequate valuation of time. We think that, in the case of developing countries, taking the minimum wage as the valuation of time for domestic production may be a more accurate definition of the opportunity cost (except if it is estimated at the individual level, for each household, as suggested in Gardes (2013)). Indeed, the important amount of unqualified labor and the rigidities of the labor market in these countries allow for a cheaper substitutability between the time one spends in the domestic production and the cost of paying somebody else to execute these activities instead. Also, when the market wage is used in lieu of the minimum wage, the estimated wages may cover some of the distortions due to the different valuation of time. These distortions are bigger in countries where the inequalities in the market wages are important. Income inequalities are therefore an essential matter to take into account when we valuate the time in the domestic production.

The results reflect that if one is interested in measuring the impact of a given policy by sub-populations, the best way to group the population is by education level. Indeed, the categorization by education level has some advantages: First of all, it can be considered as exogenous, contrary to income. Second, there is a clearer pattern of consumption; Third, it avoids the heterogeneity that exists when we group by age range. And finally, it

circumvents the divergence in the last quartile of income where coexist households with secondary and tertiary education with a big discrepancy of income. As the number of households with tertiary education is very low, the last quartile of income mixes both types of households generating big heterogeneity within the group. Specially, as seen in the descriptive statistics, the wages of households with tertiary education are twice as high as the ones with secondary education only. Therefore it is better to divide the sub-population by education level is better than using a categorization based on age range or income level.

It is important to notice that the changes in full expenditure are lower in magnitude than the changes in monetary and time expenditure separately. This highlights the relevance of the introduction of domestic production into the estimations since the substitution effect between time and money is taken into account.

Finally, the results of the welfare analysis are, in general, robust and consistent with those of the computed monetary distance indices. That is, when the opportunity cost of time is valuated at the minimum wage, the poorest households have a bigger loss of utility compared to the richest ones. As explained above, since the minimum wage is a better proxy of the opportunity cost of time in developing countries, these results reinforce the idea that the poorest households face a bigger loss on welfare when there is an increase in indirect taxes.

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AppendixA

Table A.1: Descriptive Statistics (Ecuador, Whole Sample)

	Socio-Economic Variables				
Variables	Obs	Mean	Std. Dev	Min	Max
Income per Capita	7482	2,962	2,315	182	25,134
Household Size	7482	3.34	1.70	1	13
Age Household Head	7482	42.47	16.08	12	98
Percentage Urban Households	7482	0.59	0.49	0	1
Ave. Number of Children	7482	1.59	1.51	0	11
Percentage Couples	7482	0.77	0.42	0	1
Primary Education	7482	0.53	0.50	0	1
Secondary Education	7482	0.31	0.46	0	1
Tertiary Education	7482	0.16	0.37	0	1

Ecuador data is shown in local currency, US dollars

Table A.2: Descriptive Statistics (Ecuador, Subsamples)

	Socio-Economic Variables									
Variables	Q1	Q2	Q3	Q4	-30	30-60	60+	Primary	Secondary	Tertiary
Income per capita	553	1,320	2,258	5,673	2,073	2,664	2,104	1,577	2,599	5,071
Household Size	3.55	3.65	3.25	2.92	3.31	3.73	1.84	3.34	3.44	3.17
Age Household Head	47.30	39.68	39.57	43.33	25.12	40.96	71.94	46.73	36.65	39.46
Percentage Urban Households	0.32	0.53	0.67	0.84	0.58	0.61	0.49	0.41	0.74	0.89
Ave. Number of children	1.87	1.87	1.47	1.17	1.50	1.96	0.28	1.61	1.67	1.40
Percentage Couples	0.70	0.79	0.79	0.78	0.82	0.80	0.56	0.75	0.79	0.78
Primary Education	0.79	0.64	0.47	0.23	0.46	0.48	0.85	1	0	0
Secondary Education	0.19	0.30	0.40	0.34	0.41	0.32	0.10	0	1	0
Tertiary Education	0.02	0.06	0.13	0.43	0.13	0.20	0.05	0	0	1

Ecuador data is shown in local currency, US dollars
Data shown in mean values

Table A.3: Descriptive Statistics (Guatemala, Whole Sample)

	Socio-Economic Variables				
Variables	Obs	Mean	Std. Dev	Min	Max
Income per Capita	3759	14,729	40,336	31	1,524,248
Household Size	3759	4.31	2.03	1	12
Age Household Head	3759	38.49	14.34	16	95
Percentage Urban Households	3759	0.45	0.50	0	1
Ave. Number of Children	3759	2.43	1.92	0	9
Percentage Couples	3759	0.82	0.39	0	1
Primary Education	3759	0.77	0.42	0	1
Secondary Education	3759	0.17	0.38	0	1
Tertiary Education	3759	0.06	0.24	0	1

Guatemala data is shown in local currency, Quetzales

Table A.4: Descriptive Statistics (Guatemala, Subsamples)

	Socio-Economic Variables									
Variables	Q1	Q2	Q3	Q4	-30	30-60	60+	Primary	Secondary	Tertiary
Income per Capita	2,720	5,902	10,583	39,739	12,568	15,807	14,789	9,640	23,234	56,278
Household Size	4.76	4.62	4.32	3.55	3.90	4.89	2.23	4.47	3.84	3.62
Age Household Head	38.63	38.17	38.09	39.05	25.11	39.62	70.18	39.47	34.35	37.74
Percentage Urban Households	0.24	0.34	0.46	0.73	0.40	0.46	0.45	0.34	0.77	0.90
Ave. Number of children	2.89	2.70	2.42	1.70	2.00	3.01	0.32	2.58	1.98	1.73
Percentage Couples	0.80	0.82	0.83	0.80	0.87	0.83	0.61	0.81	0.82	0.86
Primary Education	0.95	0.90	0.78	0.45	0.75	0.76	0.90	1	0	0
Secondary Education	0.04	0.09	0.20	0.35	0.22	0.17	0.08	0	1	0
Tertiary Education	0.01	0.01	0.02	0.20	0.04	0.08	0.02	0	0	1

Guatemala data is shown in local currency, Quetzales
Data shown in mean values

AppendixB

Table B.1: Ecuador: Household Time Expenditure under Status Quo and Post Reform

Status Quo (American Dollar)					
Minimum Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	2,101.28	2,088.79	2,082.29	2,117.25	2,117.15
Housing	818.32	750.14	791.80	834.56	897.24
Transport	365.48	278.48	346.00	402.69	435.32
Clothing	417.34	421.63	430.46	422.41	394.77
Personal Care	625.74	554.74	613.80	645.83	688.96
Health	196.24	209.31	179.03	183.90	212.78
Education	368.95	297.89	390.69	393.83	393.46
Leisure	2,189.28	1,833.97	2,037.82	2,264.99	2,622.78
Others	214.13	319.89	215.50	183.31	137.46
Post Reform (American Dollar)					
Market Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	2,101.73	2,089.57	2,082.35	2,117.80	2,117.42
Housing	818.32	750.01	791.77	834.48	896.91
Transport	365.03	278.32	345.62	402.09	434.56
Clothing	417.41	421.68	430.43	422.64	394.87
Personal Care	625.71	554.52	613.94	645.71	688.85
Health	196.26	209.28	178.97	183.92	212.85
Education	368.56	297.64	390.30	393.73	393.52
Leisure	2,189.66	1,834.04	2,038.57	2,265.17	2,623.67
Others	214.08	319.77	215.43	183.23	137.28

Table B.2: Ecuador: Household Full Expenditure under Status Quo and Post Reform

Status Quo (American Dollar)					
Minimum Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	3,451.86	3,007.95	3,225.77	3,565.52	4,011.84
Housing	1,171.95	881.58	1,000.44	1,171.16	1,636.52
Transport	618.03	364.59	489.46	632.29	987.37
Clothing	557.90	478.30	515.36	562.08	676.37
Personal Care	705.26	586.10	667.92	724.63	843.02
Health	396.10	311.57	312.06	368.94	592.46
Education	479.45	333.65	456.52	497.01	631.12
Leisure	2,389.01	1,895.80	2,151.58	2,467.40	3,044.70
Others	489.30	374.14	327.38	406.92	849.66
Post Reform (American Dollar)					
Market Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	3,442.17	3,001.37	3,218.27	3,550.94	3,994.69
Housing	1,175.64	884.70	1,003.78	1,178.25	1,641.22
Transport	618.64	364.90	490.17	633.43	988.68
Clothing	558.40	479.14	515.63	562.70	677.06
Personal Care	705.96	586.36	668.89	725.51	843.48
Health	398.24	312.90	312.69	370.58	595.79
Education	479.51	333.76	456.44	496.97	633.29
Leisure	2,389.59	1,896.13	2,152.86	2,468.06	3,045.76
Others	490.72	374.43	327.76	409.51	853.09

Table B.3: Guatemala: Household Time Expenditure under Status Quo and Post Reform

Status Quo (Quetzales)					
Minimum Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	1,497.21	1,690.82	1,546.55	1,427.10	1,324.18
Housing	1,127.29	1,063.22	992.00	1,170.85	1,283.27
Transport	514.08	381.95	415.01	579.59	679.93
Clothing	604.46	667.88	655.22	595.13	499.51
Personal Care	569.08	511.21	527.21	560.58	677.44
Health	10.04	9.07	8.41	10.75	11.92
Education	1,929.47	1,931.35	1,908.81	1,839.87	2,037.97
Leisure	1,312.60	835.08	1,151.22	1,390.49	1,874.23
Post Reform (Quetzales)					
Market Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	1,528.77	1,719.56	1,582.22	1,465.82	1,352.50
Housing	1,112.39	1,049.69	973.52	1,153.69	1,271.07
Transport	511.77	379.58	412.70	575.91	678.42
Clothing	602.25	665.15	652.88	591.90	498.62
Personal Care	563.72	507.07	521.49	555.25	669.55
Health	9.97	8.96	8.37	10.71	11.86
Education	1,925.89	1,927.40	1,904.70	1,835.21	2,035.80
Leisure	1,309.49	833.17	1,148.56	1,385.86	1,870.61

Table B.4: Guatemala: Household Full Expenditure under Status Quo and Post Reform

Status Quo (Quetzales)					
Minimum Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	7,635.18	5,909.41	6,888.77	7,663.16	10,081.97
Housing	5,857.64	3,340.27	3,832.93	4,873.66	11,389.60
Transport	1,612.31	446.46	649.01	1,171.00	4,185.49
Clothing	1,266.66	861.89	995.02	1,202.49	2,008.02
Personal Care	1,241.93	563.34	771.15	1,088.81	2,545.78
Health	397.55	179.67	299.42	356.89	754.62
Education	2,002.47	1,287.62	1,538.39	1,783.58	3,401.79
Leisure	1,935.83	620.13	1,005.87	1,585.85	4,534.24
Post Reform (Quetzales)					
Market Wage					
Income group	**WS**	**Q1**	**Q2**	**Q3**	**Q4**
Food	7,611.03	5,900.97	6,874.42	7,639.94	10,041.58
Housing	5,873.00	3,347.58	3,841.58	4,882.71	11,416.71
Transport	1,618.91	447.32	651.13	1,177.69	4,200.52
Clothing	1,267.29	862.04	996.35	1,204.25	2,007.75
Personal Care	1,242.90	563.06	771.52	1,091.62	2,543.63
Health	401.63	181.34	303.95	362.68	758.62
Education	2,000.98	1,287.53	1,536.80	1,782.93	3,399.37
Leisure	1,933.84	618.96	1,004.82	1,583.62	4,533.34